

IN THE CLAIMS

Please amend the claims as follows:

1. (Currently amended) A method of performing incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

obtaining a selected rate for data transmission on a MIMO channel between a plurality of transmit antennas at a transmitter and a plurality of receive antennas at a receiver, the selected rate indicating a particular data rate, or a particular coding scheme, or a particular code rate, or a particular modulation scheme, or a particular data packet size, or a combination thereof;

~~processing-encoding~~ a data packet in accordance with the selected rate to obtain coded information for the data packet;

processing the coded information for the data packet to obtain a plurality of symbol blocks, each symbol block including a different portion of the coded information for the data packet;

transmitting a first symbol block from the plurality of transmit antennas at the transmitter to the plurality of receive antennas at the receiver, wherein the first symbol block is one of the plurality of symbol blocks; and

transmitting remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted, wherein each of the plurality of symbol blocks is transmitted at most once to the receiver.

2. (Canceled)

3. (Currently amended) The method of claim 1, wherein the processing includes ~~encoding the data packet in accordance with the particular coding scheme indicated by the selected rate to obtain a coded packet~~;

partitioning the coded information for the data packet into a plurality of coded subpackets, and

modulating the plurality of coded subpackets in accordance with the particular modulation scheme indicated by the selected rate to obtain the plurality of symbol blocks.

4. (Currently amended) The method of claim 1-3, wherein the coding scheme comprises a Turbo code, and wherein the first symbol block includes systematic bits for the data packet.

5. (Previously presented) The method of claim 1, further comprising:
receiving, at the transmitter, a negative acknowledgment (NAK) for the data packet from the receiver; and
transmitting a next symbol block among the remaining ones of the plurality of symbol blocks in response to receiving the NAK.

6. (Previously presented) The method of claim 1, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and wherein each of the plurality of symbol blocks is transmitted from a plurality of subbands of the plurality of transmit antennas if the symbol block is selected for transmission.

7. (Previously presented) The method of claim 1, wherein at least two data packets are each processed in accordance with the selected rate to obtain at least two pluralities of symbol blocks, one plurality of symbol blocks for each data packet, and wherein at least two symbol blocks for the at least two data packets are transmitted simultaneously from the plurality of transmit antennas to the plurality of receive antennas.

8. (Currently amended) A method of performing incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

~~processing a data packet~~ encoding at least two data packets to obtain coded information for each of the at least two data packets;

processing the coded information for each data packet to obtain a plurality of symbol blocks for the data packet, each symbol block including a different portion of the coded information for the data packet;

transmitting a first symbol block for each data packet from a plurality of transmit antennas at a transmitter to a plurality of receive antennas at a receiver, wherein the first symbol block is one of the plurality of symbol blocks for the data packet; and

transmitting remaining ones of the plurality of symbol blocks for each data packet, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and wherein each symbol block for each data packet ~~of at least two symbol blocks for at least two data packets~~ is transmitted diagonally across a plurality of subbands and the plurality of transmit antennas, and wherein each of the plurality of symbol blocks for each data packet is transmitted at most once to the receiver.

9. (Previously presented) The method of claim 1, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), the method further comprising:

processing each of N_P data packets in accordance with the selected rate to obtain N_P pluralities of symbol blocks, one plurality of symbol blocks for each data packet, where N_P is equal to or greater than one and is selected based on a rank of the MIMO channel, and

transmitting N_P symbol blocks for the N_P data packets simultaneously diagonally across a plurality of subbands and the plurality of transmit antennas.

10. (Currently amended) A transmitter operative to perform incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

a transmit data processor operative to

obtain a selected rate for data transmission on a MIMO channel between a plurality of transmit antennas at the transmitter and a plurality of receive antennas at a receiver, the selected rate indicating a particular data rate, or a particular coding scheme, or a particular code rate, or a particular modulation scheme, or a particular data packet size, or a combination thereof, ~~and process~~

encode a data packet in accordance with the selected rate to obtain coded information for the data packet, and

process the coded information for the data packet to obtain a plurality of symbol blocks, each symbol block including a different portion of the coded information for the data packet; and

a controller operative to

initiate transmission of a first symbol block from the plurality of transmit antennas at the transmitter to the plurality of receive antennas at the receiver, wherein the first symbol block is one of the plurality of symbol blocks, and

initiate transmission of remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted, wherein each of the plurality of symbol blocks is transmitted at most once to the receiver.

11. (Currently amended) The transmitter of claim 10, wherein the transmit data processor is operative to

~~encode the data packet in accordance with the particular coding scheme indicated by the selected rate to obtain a coded packet,~~

partition the coded information for the data packet into a plurality of coded subpackets, and

modulate the plurality of coded subpackets in accordance with the particular modulation scheme indicated by the selected rate to obtain the plurality of symbol blocks.

12. (Original) The transmitter of claim 10, further comprising:

a transmit spatial processor operative to receive a symbol block to be transmitted and provide symbols in the symbol block to the plurality of transmit antennas.

13. (Currently amended) An apparatus operative to perform incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

means for obtaining a selected rate for data transmission on a MIMO channel between a plurality of transmit antennas at a transmitter and a plurality of receive antennas at a receiver, the selected rate indicating a particular data rate, or a particular coding scheme, or a

particular code rate, or a particular modulation scheme, or a particular data packet size, or a combination thereof;

means for ~~processing~~encoding a data packet to obtain coded information for the data packet;

means for processing the coded information for the data packet to obtain a plurality of symbol blocks, each symbol block including a different portion of the coded information for the data packet;

means for transmitting a first symbol block from the plurality of transmit antennas at the transmitter to the plurality of receive antennas at the receiver, wherein the first symbol block is one of the plurality of symbol blocks; and

means for transmitting remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly at the receiver or all of the plurality of symbol blocks are transmitted, wherein each of the plurality of symbol blocks is transmitted at most once to the receiver.

14. (Currently amended) The apparatus of claim 13, wherein the means for processing includes

~~means for encoding the data packet in accordance with the particular coding scheme indicated by the selected rate to obtain a coded packet,~~

means for partitioning the coded information for the data packet into a plurality of coded subpackets, and

means for modulating the plurality of coded subpackets in accordance with the particular modulation scheme indicated by the selected rate to obtain the plurality of symbol blocks.

15. (Currently amended) A method of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by

encoding the data packet to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver;

decoding all detected symbol blocks obtained for the data packet to provide a decoded packet;

determining whether the decoded packet is correct or in error; and

repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error.

16. (Previously presented) The method of claim 15, further comprising:

receiving a block of received symbols corresponding to the data symbol block; and

processing the received symbol block to obtain the detected symbol block.

17. (Previously presented) The method of claim 16, wherein the processing the received symbol block comprises processing the received symbol block based on a minimum mean square error (MMSE) detector, or a maximal ratio combining (MRC) detector, or a linear zero-forcing (ZF) detector, or a combination thereof.

18. (Original) The method of claim 15, further comprising:

terminating the obtaining, decoding, and determining if the decoded packet is correct or if the plurality of data symbol blocks for the data packet have been transmitted.

19. (Original) The method of claim 15, further comprising:

sending an acknowledgment (ACK) for the data symbol block if the decoded packet is correct or a negative acknowledgment (NAK) if the decoded packet is in error.

20. (Canceled)

21. (Currently amended) A method of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

determining a rate for data transmission based on an average spectral efficiency for a plurality of transmit antennas at a transmitter, the rate indicating a particular data rate, or a particular coding scheme, or a particular code rate, or a particular modulation scheme, or a particular data packet size, or a combination thereof;

obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from the plurality of transmit antennas at the transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet based on the rate to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver;

decoding all detected symbol blocks obtained for the data packet to provide a decoded packet;

determining whether the decoded packet is correct or in error; and

repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error.

22. (Previously presented) The method of claim 15, further comprising:

deriving a signal-to-noise-and-interference ratio (SNR) estimate for each of the plurality of transmit antennas,

computing an average SNR based on SNR estimates for the plurality of transmit antennas, and

selecting a rate, based on the average SNR, for data transmission on a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas, the selected rate indicating a particular data rate, or a particular coding scheme, or a particular code rate, or a particular modulation scheme, or a particular data packet size, or a combination thereof.

23. (Currently amended) A receiver operative to receive an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

a receive data processor operative to

obtain a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver,

decode all detected symbol blocks obtained for the data packet to provide a decoded packet, and

determine whether the decoded packet is correct or in error; and

a controller operative to, if the decoded packet is in error, direct the receive data processor to repeat obtaining a new block of detected symbols, decoding all detected symbol blocks, and determining whether the decoded packet is correct or in error.

24. (Previously presented) The receiver of claim 23, further comprising:

a receive spatial processor operative to obtain a block of received symbols for the data symbol block and to process the received symbol block to obtain the detected symbol block.

25. (Canceled)

26. (Currently amended) An apparatus for receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

means for obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver;

means for decoding all detected symbol blocks obtained for the data packet to obtain a decoded packet;

means for determining whether the decoded packet is correct or in error; and
means for repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error.

27. (Previously presented) The apparatus of claim 26, further comprising:
means for receiving a block of received symbols for the data symbol block; and
means for processing the received symbol block to obtain the detected symbol block.

28. (Currently amended) A method of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

receiving a block of received symbols for a data packet, wherein the received symbol block is for a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver;

detecting all received symbol blocks received for the data packet to obtain detected symbol blocks, one detected symbol block for each received symbol block;

decoding the detected symbol blocks for the data packet to obtain decoder feedback information;

performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration; and

generating a decoded packet based on an output from the decoding for a ~~final~~ last iteration among the plurality of iterations.

29. (Original) The method of claim 28, further comprising:
determining whether the decoded packet is correct or in error; and

repeating the receiving, detecting, decoding, performing, and generating for another one of the plurality of data symbol blocks if the decoded packet is in error and if all of the plurality of data symbol blocks have not been transmitted.

30. (Canceled)

31. (Previously presented) The method of claim 28, wherein the detecting is based on a minimum mean square error (MMSE) detector, or a maximal ratio combining (MRC) detector, or a linear zero-forcing (ZF) detector, or a combination thereof.

32. (Previously presented) The method of claim 31, wherein the MMSE detector is used for the detecting for at least one iteration and the MRC detector or the ZF detector is used for the detecting after the at least one iteration.

33. (Currently amended) A receiver operative to receive an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

a buffer operative to receive and store a block of received symbols for a data packet, wherein the received symbol block is for a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver;

a detector operative to detect all received symbol blocks received for the data packet to obtain detected symbol blocks, one detected symbol block for each received symbol block; and

a decoder operative to decode all detected symbol blocks for the data packet to obtain decoder feedback information,

wherein the detector and decoder are operative to perform detection and decoding for a plurality of iterations, wherein the decoder feedback information from the decoder for a current iteration is used by the detector for a subsequent iteration, and wherein a decoded

packet is generated based on output from the decoder for a ~~final~~last iteration among the plurality of iterations.

34. (Currently amended) The receiver of claim 33, further comprising:

a controller operative to, if the decoded packet is in error and if all of the plurality of data symbol blocks have not been transmitted, direct the buffer to receive and store another received symbol block for another one of the plurality of data symbol blocks, and to direct the detector and the decoder to perform detection and decoding on all received symbol blocks received for the data packet to obtain the decoded packet.

35. (Currently amended) An apparatus for receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

means for receiving a block of received symbols for a data packet, wherein the received symbol block is for a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver;

means for detecting all received symbol blocks received for the data packet to obtain detected symbol blocks, one detected symbol block for each received symbol block;

means for decoding all detected symbol blocks for the data packet to obtain decoder feedback information;

means for performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration; and

means for generating a decoded packet based on decoder output from the decoding for a ~~final~~last iteration among the plurality of iterations.

36. (Original) The apparatus of claim 35, further comprising:

means for determining whether the decoded packet is correct or in error; and

means for repeating the receiving, detecting, decoding, performing, and generating for another one of the plurality of data symbol blocks if the decoded packet is in error and all of the plurality of data symbol blocks have not been transmitted.

37. (Currently amended) A method of receiving a data transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

detecting received symbols for a data packet to obtain detected symbols;
decoding the detected symbols to obtain decoder feedback information;
performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration, wherein the detecting is performed based on a minimum mean square error (MMSE) detector for at least one iteration initially, and thereafter based on a maximal ratio combining (MRC) detector or a linear zero-forcing (ZF) detector for remaining ones of the plurality of iterations; and

generating a decoded packet based on an output from the decoding for a ~~final~~last iteration among the plurality of iterations.

38. (Previously presented) The method of claim 37, wherein the detecting is performed based on the MMSE detector for only a first iteration and based on the MRC detector or the ZF detector for remaining ones of the plurality of iterations.

39. (Previously presented) The method of claim 1, further comprising:
transmitting the data packet and at least one additional data packet in an interlaced manner, wherein symbol blocks for each data packet are transmitted in slots spaced apart by a predetermined number of slots.

40. (Canceled)

41. (Currently amended) A non-transitory processor-readable medium encoded with instructions capable of being executed by a processor for transmitting data in a wireless multiple-input multiple-output (MIMO) communication system, comprising codes executable to

obtain a selected rate for data transmission on a MIMO channel between a plurality of transmit antennas at a transmitter and a plurality of receive antennas at a receiver, the selected rate indicating a particular data rate, or a particular coding scheme, or a particular code rate, or a particular modulation scheme, or a particular data packet size, or a combination thereof;

~~process-encode~~ a data packet in accordance with the selected rate to obtain coded information for the data packet;

process the coded information for the data packet to obtain a plurality of symbol blocks, each symbol block including a different portion of the coded information for the data packet;

send a first symbol block from the plurality of transmit antennas at the transmitter to the plurality of receive antennas at the receiver, wherein the first symbol block is one of the plurality of symbol blocks; and

send remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted, wherein each of the plurality of symbol blocks is transmitted at most once to the receiver.

42. (Previously presented) The method of claim 15, further comprising:
obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and
selecting, based on the channel estimates, a rate for data transmission on the MIMO channel.

43. (Previously presented) The receiver of claim 23, further comprising:
a channel estimator operative to obtain channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and
a rate selector operative to select, based on the channel estimates, a rate for data transmission on the MIMO channel.

44. (Previously presented) The apparatus of claim 26, further comprising:
means for obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and

means for selecting, based on the channel estimates, a rate for data transmission on the MIMO channel.

45. (Previously presented) The method of claim 28, further comprising:
obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and
selecting, based on the channel estimates, a rate for data transmission on the MIMO channel.

46. (Previously presented) The receiver of claim 33, further comprising:
a channel estimator operative to obtain channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and
a rate selector operative to select, based on the channel estimates, a rate for data transmission on the MIMO channel.

47. (Currently amended) The ~~apparatus receiver~~ of claim 35, further comprising:
means for obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and
means for selecting, based on the channel estimates, a rate for data transmission on the MIMO channel.

48. (Previously presented) The method of claim 37, further comprising:
obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and
selecting, based on the channel estimates, a rate for data transmission on the MIMO channel.

49. (Currently amended) A non-transitory processor-readable medium encoded with instructions capable of being executed by a processor for receiving data in a wireless multiple-input multiple-output (MIMO) communication system, comprising codes executable to

obtain a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver;

decode all detected symbol blocks obtained for the data packet to provide a decoded packet;

determine whether the decoded packet is correct or in error; and

repeat obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error.